INTEX-NA Flight 6: July 10, 2004

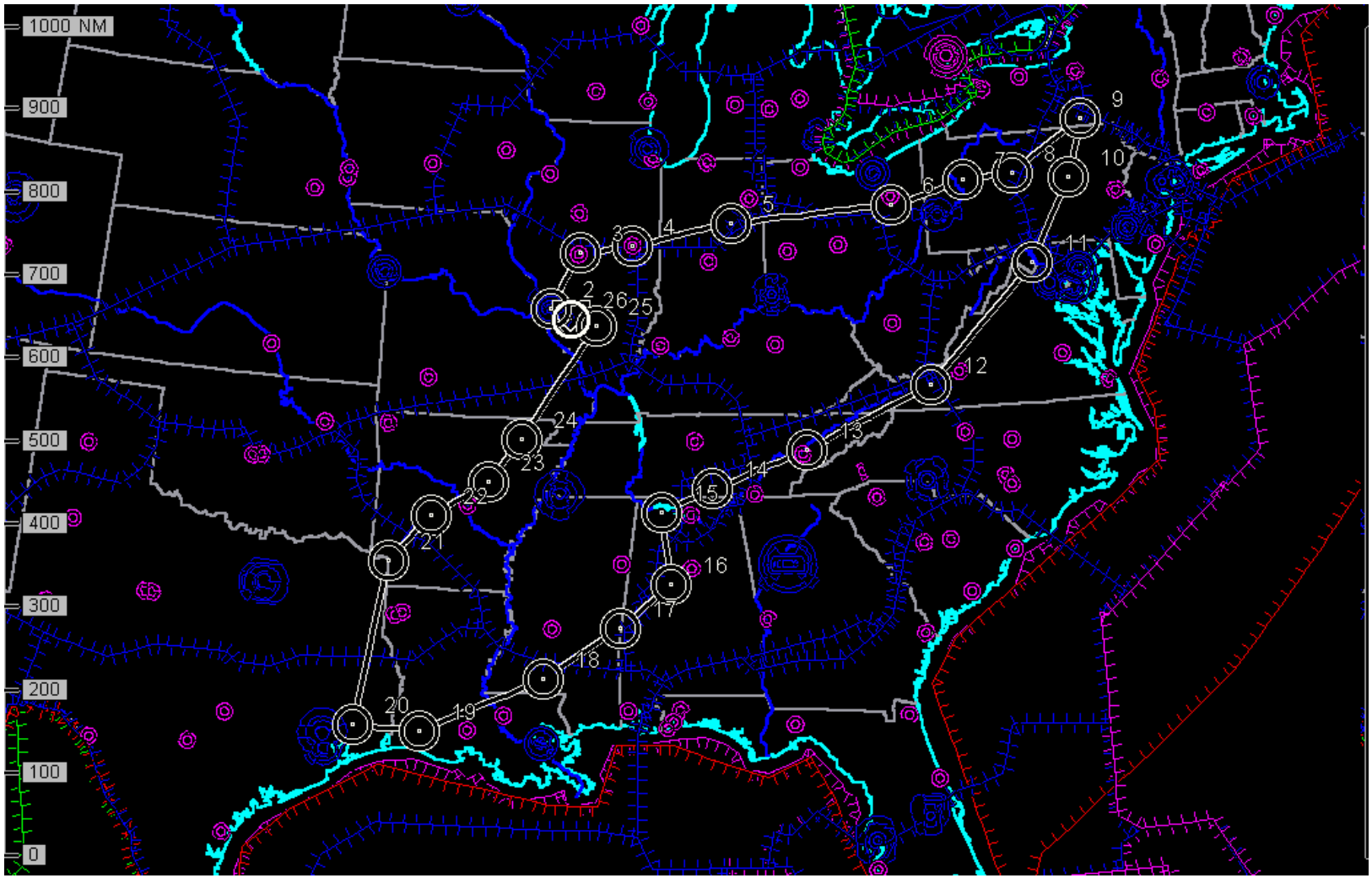
This was the second INTEX science flight from MidAmerica and was focused on the validation of instruments aboard the Envisat (SCHIA) and Aqua (AIRS, MODIS) satellites, mapping of mid-western boundary layer pollution, sampling of deep convection, exploring the relationship between biogenic emissions and their products, and characterization of outflow from Texas. The flight was guided by forecasts from multiple models supporting INTEX along with meteorological analysis and just in time GOES imagery. Total flight duration was 9.0 hours with a nominal 9:00 am takeoff. Basic flight patterns are shown in the slides below although these were greatly modified during the flight due to cloudy weather conditions.

Meteorological conditions near the surface included a diffuse front that extended from North Carolina, through the Ohio River Valley, to a weak low over South Dakota. A broad but weak series of high pressure centers stretched from Michigan southward to the Florida Panhandle. These highs produced northerly flow over the eastern flight track and southerly flow over the western sections. The middle and upper tropospheric flow was dominated by a strong anticyclone centered over the Florida Panhandle that produced clockwise flow similar to that at the surface. However, the northern reaches of the flight area experienced westerly winds. Cloudiness and deep convection were widespread over the area. The early morning northern section of the flight had multiple layers of mostly stratiform type clouds. However, as the flight headed south, deep convection began to develop rapidly due to afternoon heating. The southern Appalachian region experienced strong convection during flight time that caused us to shift the flight track farther east. Leaving that area, the early southwest segment was devoid of deep convection but did contain the typical afternoon shallow cumulus clouds. Deep convection was encountered again as we approached southwest Louisiana and Houston.

We flew in the north easterly direction and sampled boundary layer mid-west pollution. Descent into the boundary layer encountered heavy pollution with CO>300 ppb, SO2>1ppb, HNO3 > 2ppb and significant levels of absorbing aerosol. At 1600 UT we spiraled up to 33,000 ft at the Envisat rendezvous point in a largely cloud free region with some scattered clouds at lower levels. Substantial concentrations of HCHO and NO2 were present and should provide an excellent test for SCHIA capability. There was clear evidence of deep convection with polluted layers at >28,000 ft with CO some 20 ppb above expected background. At 33000 ft concentrations of NO2 and HCHO in excess of 200 ppt were observed with little H2O2. Descent into the boundary layer after SCIA rendezvous saw midlevel pollution. The flight plan was altered to find cloud free conditions for AIRS validation. DC-8 spiraled up at 1725 UT from 4000 ft to 35000 ft under nearly cloud free conditions suitable for AIRS validation. Thunder storms in the area pumped up surface air to high levels and deep convection was evident with moderate pollution possibly due to persistent southerly flow from the Gulf Coast. We sampled over Ozarks and other southern locations at very low levels and once again encountered moderately high concentrations of HCHO (3-4 ppb), CO (150 ppb), and aerosol (SO4 and NH4) but relatively little O3 (45 ppb). Although puzzling, there was no indication of significant CO2 drawdown at these locations. Encounter with a smoke plume detected highest levels of CO >500 ppb, formaldehyde (>16 ppb) and aerosols yet. Overall, this was a successful flight that encountered interesting new phenomenon and accomplished most of the planned science objectives despite alterations due to poor weather conditions.

The navigational data are available at URL: http://www.dfrc.nasa.gov/Research/AirSci/DC-8/ICATS/index.html

INTEX-NA Flight 6: July 10, 2004



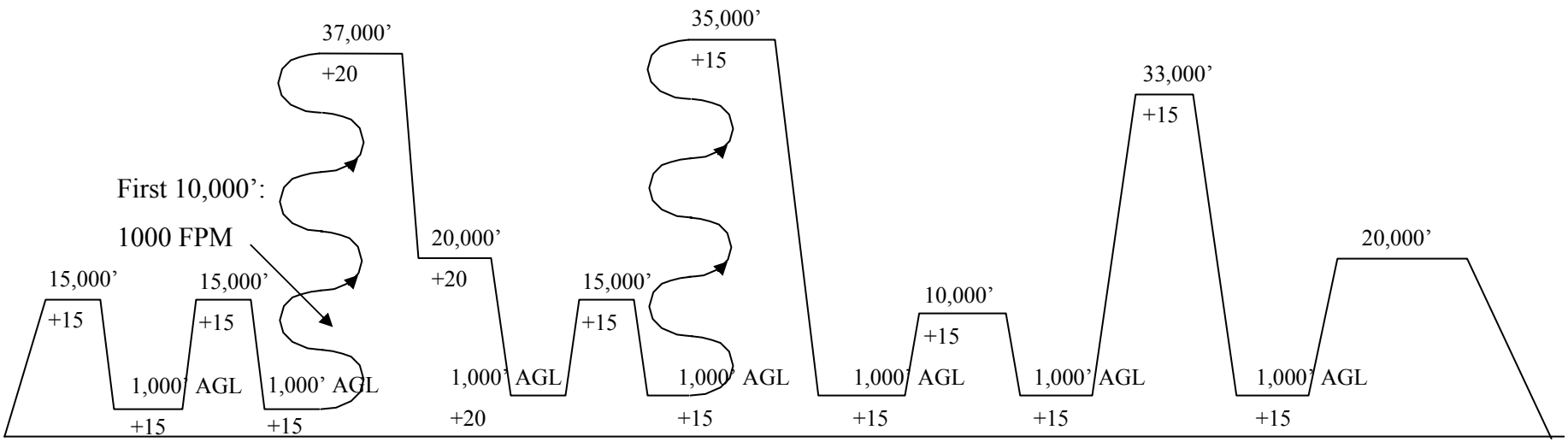
INTEX-NA Flight 6: July 10, 2004

ALL CLIMBS/DESCENTS

1500 FPM unless noted

SPIRAL DESCENT

1500 FPM



BLV PT7 PT9 PT14 PT20 BLV

INTEX-NA Flight 6: July 10, 2004

TYPE ACFT	CALL SIGN	DATE	FROM	TO	PLND TO	ACT TO	PILOT	COPILOT
DC-8	NASA817		SCOTT AFB MID N 38 32.7 W089 50.1	SCOTT AFB MID N 38 32.7 W089 50.1	14:30			

TOT DIST	TOT TIME	FUEL REQ	NAVIGATOR	ENGINEER
2805.8	09+00	92751		

TP DTD#	Fix/Point Description	FREQ	Latitude Longitude	Alt Wind	TAS GS	TC MC	LEG DIST DIST REM	LEG TIME TIME REM	ETA	RETA	ATA	REMARKS
1	KBLV/A SCOTT AFB MID		N 38 32.7 W089 50.1	459M		136 137	5.0 2801	00+02 08+58	14:30			
2	CSX/E CARDINAL	111Y 116.45	N 38 45.2 W090 21.7	12214M	N/A N/A	300 300	32.4 2768	00+06 08+52	14:38			
3	CAP/R CAPITAL	074X 112.70	N 39 53.5 W089 37.5	20000M	360 360	027 027	76.4 2692	00+13 08+39	14:51			
4	CMI/R CHAMPAIGN	037X 110.00	N 40 02.1 W088 16.6	20000M	360 360	082 084	62.8 2629	00+10 08+28	15:01			
5	MZZ/E MARION	023X 108.60	N 40 29.6 W085 40.8	20000M	360 360	077 080	122.4 2507	00+20 08+08	15:22			
6	BSV/E BRIGGS	071X 112.40	N 40 44.4 W081 25.9	20000M	360 360	086 092	194.6 2312	00+32 07+35	15:54			
7	EWC/R050014	105X 115.80	N 41 00.0 W080 00.0	20000M	360 360	077 085	67.0 2245	00+11 07+24	16:05			SPIRAL
	.delay	105X 115.80	N 41 00.0 W080 00.0	20000M	360 360	077 086	0.0 2245	00+35 06+49	16:40			
8	ETG/R KEATING	107X 116.00	N 41 12.9 W078 08.6	20000M	360 360	081 091	85.2 2160	00+14 06+35	16:55			
9	CFB/R BINGHAMTON	059X 112.20	N 42 09.4 W076 08.2	20000M	360 360	058 070	106.4 2053	00+18 06+17	17:12			
10	MIP/R MILTON	029X 109.20	N 41 01.4 W076 39.9	20000M	360 360	199 211	72.1 1981	00+12 06+05	17:24			
11	MRB/R MARTINSBURG	058X 112.10	N 39 23.1 W077 50.9	20000M	360 360	209 220	112.2 1869	00+19 05+47	17:43			
12	PSK/R PULASKI	115X 116.80	N 37 05.3 W080 42.8	20000M	360 360	224 233	193.1 1676	00+32 05+14	18:15			
13	SUG/R SUGARLOAF MT	059X 112.20	N 35 24.4 W082 16.1	20000M	360 360	217 224	125.9 1550	00+21 04+53	18:36			

INTEX-NA Flight 6: July 10, 2004

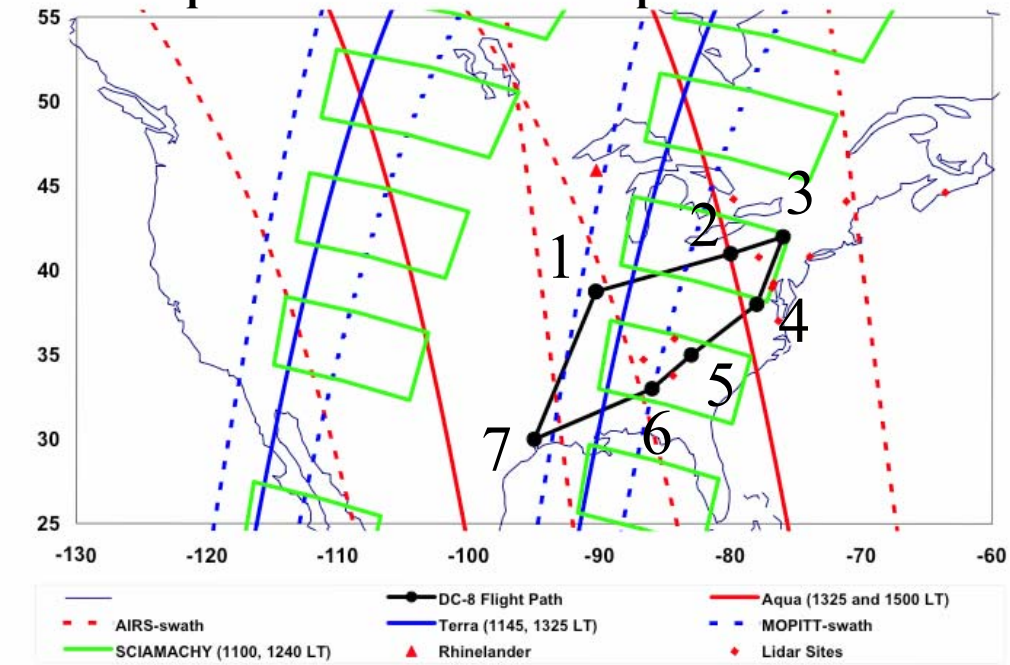
TP DTD#	Fix/Point Description	FREQ	Latitude Longitude	Alt Wind	TAS GS	TC MC	LEG DIST DIST REM	LEG TIME TIME REM	ETA	RETA	ATA	REMARKS
14	ODF/R039023	081X 113.40	N 35 00.0 W083 00.0	20000M	360 360	236 242	43.4 1507	00+07 04+46	18:43			SPIRAL
	.delay	081X 113.40	N 35 00.0 W083 00.0	20000M	360 360	236 241	0.0 1507	00+35 04+11	19:18			
15	RMG/R ROME	101X 115.40	N 34 09.8 W085 07.2	20000M	360 360	244 249	116.4 1390	00+19 03+52	19:38			
16	TDG/E TALLADEGA	025X 108.80	N 33 34.5 W086 02.6	20000M	360 360	233 236	58.0 1332	00+10 03+42	19:48			
17	OKW/R BROOKWOOD	047X 111.00	N 33 14.4 W087 15.0	20000M	360 360	252 254	63.9 1268	00+11 03+31	19:58			
18	EWA/R KEWANEE	085X 113.80	N 32 22.0 W088 27.5	20000M	360 360	229 231	80.4 1188	00+13 03+18	20:12			
19	MCB/R MC COMB	114X 116.70	N 31 18.3 W090 15.5	20000M	360 360	235 235	111.8 1076	00+19 02+59	20:30			
20	LCH/R LAKE CHARLES	081X 113.40	N 30 08.5 W093 06.3	20000M	360 360	245 243	162.9 913	00+27 02+32	20:57			
21			N 28 00.0 W095 00.0	20000M	360 360	218 215	162.3 751	00+27 02+05	21:24			
22	DAS/R DAISETTA	116X 116.90	N 30 11.4 W094 38.7	20000M	360 360	008 004	132.4 619	00+22 01+43	21:46			
23	TXK/R TEXARKANA	110X 116.30	N 33 30.8 W094 04.4	20000M	360 360	008 005	201.2 418	00+34 01+10	22:20			
24	HOT/E HOT SPRINGS	037X 110.00	N 34 28.7 W093 05.4	20000M	360 360	040 038	75.8 342	00+13 +57	22:33			
25	SRC/N SEARCY	323.00	N 35 12.7 W091 44.0	20000M	360 360	057 055	80.2 262	00+13 +44	22:46			
26	ARG/R WALNUT RIDGE	092X 114.50	N 36 06.6 W090 57.2	20000M	360 360	035 034	65.9 196	00+11 +33	22:57			
27	ENL/R CENTRALIA	097X 115.00	N 38 25.2 W089 09.5	20000M	360 360	032 032	162.9 33	00+27 +05	23:24			
28	KBLV/A SCOTT AFB MID		N 38 32.7 W089 50.1	20000M	360 360	283 284	32.7 0	00+05 +00	23:30			

INTEX Flight-6 plan July 10, 2004

Take off: 9 am
Flight time-
9 hours

Point	Latitude	Longitude	
1	38.75	-90.3	
2	41	-80	(spiral)
3	42	-76	
4	38	-78	
5	35	-83	(spiral)
6	33	-86	
7	30	-95	
8	38.75	-90.3	

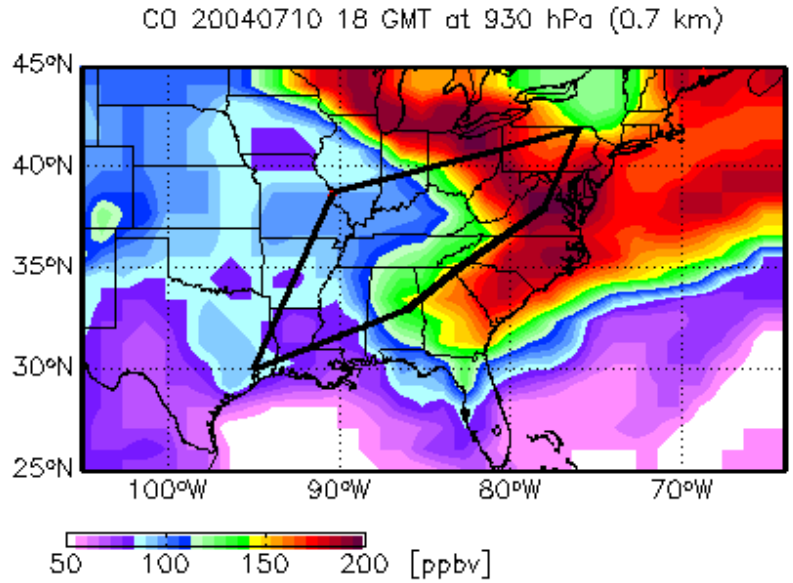
Point 2- Envisat/SCHIA underpass-1600 UT
Point 5-Aqua/AIRS-MODIS underpass-1825 UT

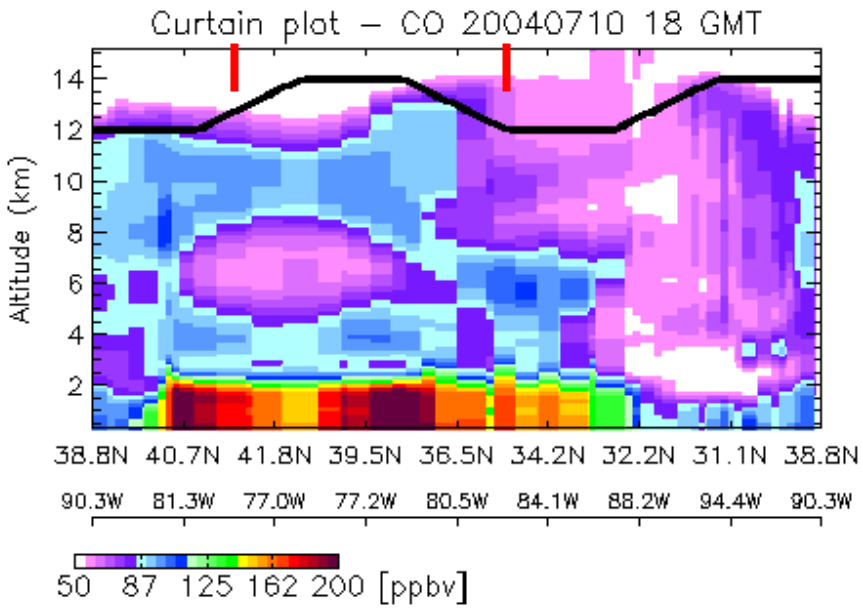


Objectives:

1. **Regional pollution buildup over midwest**
2. **Convective outflow over SE U.S. and Gulf of Mexico**
3. **Urban/biogenic influence transects across south-east and –central U.S.**
4. **Arizona fire plume over Kansas**
5. **Validation of SCIAMACHY and AIRS**

GEOS Curtain Plot- July 10, 2004





Surface